

## **CLAIMS**

What is claimed is:

1. A process for producing olefin(s) from oxygenate(s), the process comprising the steps of:
  - (a) contacting an oxygenate feed stream with an oxygenate-to-olefin catalyst to produce an effluent stream comprising carbon dioxide, oxygenate(s), water and olefin(s);
  - (b) quenching the effluent stream to produce a quench bottoms stream comprising carbon dioxide, oxygenate(s) and water and a quenched effluent stream comprising olefin(s);
  - (c) separating carbon dioxide from the quench bottoms stream;
  - (d) separating a majority of the oxygenate(s) from a majority of the water in the quench bottoms stream; and
  - (e) combining the majority of the oxygenate(s) with the oxygenate feed stream.
2. The process of claim 1, wherein in the step of (c) separating, carbon dioxide is removed from the quench bottoms stream.
3. The process of claim 2, wherein the step of (c) separating further comprises combining an acidic composition with the quench bottoms stream.
4. The process of claim 3, wherein the acidic composition comprises an inorganic acid.
5. The process of claim 4, wherein the inorganic acid comprises an inorganic acid selected from the group consisting of hydrochloric acid, nitric acid, sulfuric acid and mixtures thereof.

6. The process of claim 3, wherein the acidic composition comprises an organic acid.
7. The process of claim 6, wherein the organic acid comprises acetic acid.
8. The process of claim 1 further comprising separating the quench bottoms stream into a hydrocarbon phase and an aqueous phase.
9. The process of claim 8, wherein the hydrocarbon phase comprises aromatic hydrocarbons.
10. The process of claim 8, wherein the hydrocarbon phase comprises products of aldol condensation of aldehydes and/or ketones.
11. The process of claim 8, wherein the aqueous phase comprises organic acids.
12. The process of claim 8, wherein the aqueous phase comprises alcohol.
13. The process of claim 8, wherein the aqueous phase comprises catalyst fines.
14. The process of claim 1, wherein the step of (c) separating removes more than 10 wt.% of the carbon dioxide in the quench bottoms stream.
15. The process of claim 1, wherein the quench medium comprises the aqueous phase of the quench bottoms stream.
16. The process of claim 1, wherein the quench medium has a pH ranging from 7.1 to about 11.5.

17. The process of claim 1, wherein the step of (c) separating occurs at a pH ranging from about 6 to about 9.
18. A process for making polyolefin(s) from an oxygenate feed stream, the process comprising the steps of:
  - (a) contacting an oxygenate feed stream with an oxygenate-to-olefin catalyst to produce an effluent stream comprising oxygenate(s), carbon dioxide, water and olefin(s);
  - (b) quenching the effluent stream with a quench medium to produce an olefin stream comprising olefin(s), and a quench bottoms stream comprising carbon dioxide, oxygenate(s) and water;
  - (c) separating carbon dioxide from the quench bottoms stream;
  - (d) separating a majority of the oxygenate(s) from a majority of the water in the quench bottoms stream;
  - (e) combining the majority of the oxygenate(s) with the oxygenate feed stream; and
  - (f) converting the olefin(s) to polyolefin(s).
19. The process of claim 18, wherein the step of (c) separating carbon dioxide further comprises lowering the pH of the quench bottoms stream.
20. The process of claim 19, wherein the step of (c) separating includes combining an acidic composition with the quench bottoms stream.
21. The process of claim 20, wherein the acidic composition comprises an inorganic acid.
22. The process of claim 21, wherein the inorganic acid comprises an inorganic acid selected from the group consisting of hydrochloric acid, nitric acid, sulfuric acid and mixtures thereof.

23. The process of claim 19, wherein the acidic composition comprises an organic acid.
24. The process of claim 23, wherein the organic acid comprises acetic acid.
25. The process of claim 18, further comprises separating the quench bottoms stream into a hydrocarbon phase and an aqueous phase.
26. The process of claim 25, wherein the hydrocarbon phase comprises aromatic hydrocarbons.
27. The process of claim 25, wherein the hydrocarbon phase comprises products of aldol condensation of aldehydes and/or ketones.
28. The process of claim 25, wherein the aqueous phase comprises organic acids.
29. The process of claim 25, wherein the aqueous phase comprises alcohol.
30. The process of claim 25, wherein the aqueous phase comprises catalyst fines.
31. The process of claim 18, wherein the step of separating removes more than 10 wt.% of the carbon dioxide in the quench bottoms stream.
32. The process of claim 18, wherein the quench medium comprises the aqueous phase of the quench bottoms stream.
33. The process of claim 18, wherein the quench medium has a pH ranging from 7.1 to about 11.5.

34. An apparatus for producing olefin(s) from an oxygenate feed stream, the apparatus comprising:
- (a) a reactor having a reactor inlet and a reactor outlet;
  - (b) a quench device having a quench inlet in fluid communication with the reactor outlet, a quench overhead outlet and a quench bottoms outlet;
  - (c) a first conduit having a downstream end and an upstream end, the upstream end being in fluid communication with the quench bottoms outlet;
  - (d) a separation vessel having a first separation vessel outlet in fluid communication with the downstream end, a first separation vessel outlet and a second separation vessel outlet, wherein the separation vessel is configured to separate a mixture into a liquid component and a gaseous component and remove the gaseous component through the first vessel outlet and the liquid component through the second vessel outlet;
  - (e) a distillation column having a column inlet, an overhead column outlet and a bottoms column outlet, wherein the column inlet is in fluid communication with the second vessel outlet and the overhead column outlet is in fluid communication with the reactor inlet; and
  - (f) an acid inlet configured to introduce an acid component in the first conduit and/or the separation vessel.